FIRST

ANNUAL REPORT

OF THE

Maryland Agricultural Experiment Station.

AT

AGRICULTURAL COLLEGE,

PRINCE GEORGE'S COUNTY,

MARYLAND.

1888.

PUBLISHED BY THE STATION.

GENERAL NOTES.

Means of Access.—The Station is situated near College Station, on the Washington Branch of the Baltimore and Ohio Railroad, eight miles north from the city of Washington and about thirty-two miles from Baltimore. Eight local trains each way stop daily at College Station, and several other trains, express, stop at Hyattsville, two miles distant. The Experiment Station building is three-quarters of a mile from the railroad station, and in plain sight.

Addresses.—Communications and packages for the Station, by mail, telegraph, express, and freight, require different addresses, as follows:

Mail: Agricultural College P. O., Prince George's Co., Md.
Telegraph: College, Md. [W. U. Telegraph Co.]
Express: College Station, Md. [U. S. Express Co.]
Freight: College Station, B. & O. R. R., Md.

Samples, etc.—Write and ask for instructions before sending samples for examination, or other articles, to the Station.

Time Necessary.—The management of the Station appeals at the outset, to those who may be regarded as forming its constituency, to be patient. Do not form great expectations of early results, but allow ample time for these slow-moving operations, before passing judgment upon the merits of the institution.

Publications sent free.—Remember, all publications of the Station are sent free to all who ask for them, and they pass free through the mails.

Correspondence is invited on any subject within the scope of the Station work.

☞ *Do not address the individual officers, but in all cases, simply:*

MD. AGR'L EXPERIMENT STATION.

Visitors will always be welcome.

MARYLAND AGRICULTURAL EXPERIMENT STATION,
AGRICULTURAL COLLEGE, MARYLAND,
January 31, 1889.

To His Excellency E. E. JACKSON,
Governor of Maryland.

SIR: I have the honor to transmit herewith the First Annual Report of that department of the State Agricultural College known as the Maryland Agricultural Experiment Station, as required by the act of Congress under which the Station was established and is maintained. This report covers the operations of the Station for the calendar year of 1888, and its financial affairs for the period ending June 30th, 1888.

Very respectfully, your obedient servant,

HENRY E. ALVORD,
Director.

ORGANIZATION

OF

THE MARYLAND AGRICULTURAL EXPERIMENT STATION.

CORPORATION:

The BOARD OF TRUSTEES of the MARYLAND AGRICULTURAL COLLEGE, *as follows:*

Members *ex-officio*, under State law:

His Excellency E. E. JACKSON, *Governor*,
President of the Board.

Hon. GEORGE PETER, *President of the Senate.*
Hon. GEORGE M. UPSHUR, *Speaker of the House of Delegates.*
Hon. WILLIAM PINKNEY WHITE, *Attorney General.*
Hon. L. VICTOR BAUGHMAN, *Comptroller of the Treasury.*
Hon. STEPHENSON ARCHER, *State Treasurer.*
Hon. NORMAN J. COLMAN, *U. S. Commissioner of Agriculture.*

Members elected by the Stockholders:

Hon. J. CARROLL WALSH, Jerusalem Mills, Harford Co.
Hon. WILMOT JOHNSON, Catonsville, Baltimore Co.
CHARLES B. CALVERT, Esq., Agricultural College, P. G. Co.
ROBERT A. DOBBIN, Esq., St. Denis, Baltimore Co.
ALLEN DODGE, Esq., Washington, D. C.

Members by Executive appointment:

	Terms expire
COL. F. CARROLL GOLDSBOROUGH, Easton, Talbot Co.,	1894
DAVID SEIBERT, Esq., Clear Spring, Washington Co.,	1894
GEORGE R. WILLIS, Esq., 213 Courtland St., Baltimore,	1892
DR. CHARLES A. WELLS, Hyattsville, Pr. George's Co.,	1892
JEREMIAH P. SILVER, Esq., Glenville, Harford Co.,	1890
DR. A. P. SHARP, Rock Hall, Kent Co.,	1890

OFFICERS AND STAFF.

HENRY E. ALVORD, C. E.,	*Director.*
HARRY J. PATTERSON, B. S.,	*Chemist.*
WILLIAM H. BISHOP, B. S.,	*Horticulturist.*
ALBERT I. HAYWARD, B. S.,	*Agriculturist.*
ERNEST H. BRINKLEY,	*Machinist.*
ELMER M. DUNN,	*Stenographer.*
W. HORACE SOPER,	*Treasurer.*

☞ *Mail Address, in all cases—*

MD. AGR'L EXPERIMENT STATION,
Agricultural College (P. O.),
Maryland.

FIRST ANNUAL REPORT

OF THE

MARYLAND AGRICULTURAL EXPERIMENT STATION

FOR THE

YEAR ENDING DECEMBER 31, 1888.

REPORT OF THE DIRECTOR.

The history and organization of this Station, with some account of its proposed work, were given in Station Bulletin No. 1, published in June, 1888. A few of the facts there stated may be repeated. The charter for the Maryland Agricultural College and "Model Farm," granted in February, 1856, included the following important section:

"SEC. 6. It shall be the duty of the said Board of Trustees to order and direct to be made and instituted on said model farm, annually, a series of experiments upon the cultivation of cereal and other plants adapted to the latitude and climate of the State of Maryland, and cause to be carefully noticed upon the records of said institution the character of said experiments, the kind of soil upon which they were undertaken, the system of cultivation adopted, the state of the atmosphere, and all other particulars which may be necessary to a fair and complete understanding of the result of said experiments."

The *first* Agricultural Experiment Station in America was thus established.* Under the law quoted, field experiments were conducted on the Maryland College farm during the years 1858 and 1859, even before the institution was ready for students.

*The charter of the Pennsylvania Farmers' High School [1854], now the Pennsylvania State College, does not allude to experiment work; but an act of the Legislature, in May, 1857, making an appropriation for that school, provided for publishing in the county newspapers the results of any experiments that might be made at the institution. In 1867 an act establishing three experimental farms in Pennsylvania expressly stated that such work, although intended, had not been accomplished up to that time. In the charter of the Michigan Agricultural College [February, 1855] experiments are mentioned, but not required, and work of this kind was not commenced at that institution till some years later. The first institution, supported by a State, and distinctively called an Agricultural Experiment Station, was established in Connecticut in the year 1875.

The Maryland Station dates its present organization and activity from the first day of April, 1888. This was a few days after the action of the Board of Trustees, formally establishing it as a department of the College and just before the first funds became available under Congressional appropriation. This report therefore covers but nine months, a period used mainly in necessary preparation for the work of later years.

LAND.

This Station was located upon the eastern portion of the Agricultural College Farm. Between forty and fifty acres of land, or so much of it as might be wanted, was chosen for experiment purposes, lying on either side of the old turnpike from Washington to Baltimore and a little more than eight miles from the former city. A great diversity of soil is included for such an area in compact form. There are clays more or less stiff and tenacious, and varying in color from deep red to bluish-grey and almost white; loams of all grades, with more or less gravel mixtures, and some acres of very light, sandy soil. Nearly all the land is worn, and greatly reduced in productiveness by continued cropping. It will therefore respond quickly to applications of fertilizing materials of any kind, and is otherwise particularly well suited for experiment work. Much fencing had to be done and a good deal of draining is still necessary to bring the land into satisfactory condition.

BUILDINGS.

In the midst of the area specially designated was a two-story brick building, with annex, situated just west of the turnpike and facing it. This was assigned for the use of the Station. This was the old manor of Rossburg, the name by which the place was known before it became the property of the College. Although nearly a hundred years old and much out of repair, it remained a substantial structure, the main building being 45 by 35 feet on the ground, and the annex 43 by 18 feet. Without much change to the exterior, the main building has had a third story added, and all has been remodeled and thoroughly repaired, at an expense of about three thousand dollars, so that very suitable and satisfactory quarters for the Station have now been provided. A hall nine feet wide extends across the middle of the first floor of the main building. On the north side are two rooms, 16 feet square and connecting, for the general offices; on the south the whole space is thrown into one large room for the chemical laboratory. On the second floor, over the

entrance, is a library and study; on the north, a room 33 by 16 feet, intended for a museum, and on the south a room for the principal assistant, and a guest-chamber. On the third floor are four good rooms for the private quarters of the assistants and a small one for meteorological apparatus and chemical stores. The rear building has been connected with the one in front by an enclosed gallery ten feet long. The ground floor of the annex has two rooms, one used for the heating apparatus and steam power, and the other for a general workshop, supplied with shafting, turning-lathe, etc., but not yet fully equipped. Above is a good seed-room, wash-room, and photographic and other closets. The buildings are heated by steam, supplied with hot and cold water under pressure, and the principal rooms lighted by gas from an automatic machine provided for the laboratory. Excepting the museum and one smaller room, the buildings are well finished, furnished, and equipped for their special uses.

LIBRARY.

The library has been already provided with several hundred volumes, including such American, English, German, and French works as have been proved most useful for reference at agricultural experiment stations. Numerous scientific periodicals incident to the work are kept on file, and nearly all of the leading agricultural journals of this country. The Station also has the use of the large collection of agricultural books and pamphlets owned by the Director.

EQUIPMENT.

The fittings and equipment of the laboratory are described in the appended report of the Chemist. The general appliances include meteorological instruments, with soil thermometers, surveying instruments, seed-testers, balances and scales for all grades of weighing, and farming tools and implements, sufficient for present purposes. Additional apparatus will soon be needed, especially complete outfits for microscopic and photographic work. The Station owns a good pair of mules, and a beginning has been made in securing animals for experiment feeding by the purchase of two Ayrshire heifers and a few Yorkshire pigs. Animals owned by the College and others, private property, are also available for experiment the present winter.

STABLING AND STORAGE.

A substantial outbuilding is a prime necessity. Some experiment work has been already lost, when approaching completion, for lack

of proper storage. A building should be erected the present year on the Station grounds, providing such stabling and storage as the funds available will allow. The Congressional appropriation makes such provisions that about twelve hundred dollars will be available for this purpose by the first of October, 1889, and the building should be completed before that date.

FINANCES.

This Station has been established, put in working order, and is conducted, without expense to the State, except the use of the land and buildings described, belonging to the Agricultural College and thus partly owned by the State. The first annual appropriation by the Congress of the United States, under the Experiment Station Act of March, 1887, was $15,000 for the fiscal year ending June 30, 1888. This furnished a building and equipment fund, which was nearly all expended within the legal limit. The account of these expenditures is appended, at page 58, with the certificate of the auditing committee representing the College Trustees [p. 48], who constitute the governing board of the institution. The next annual financial report will be for the $15,000 appropriated for the fiscal year extending from July 1, 1888, to June 30, 1889, being the last half and the first half, respectively, of the calendar or agricultural years of 1888 and 1889. This discrepancy between the periods covered by the financial statement and the "full and detailed report of operations" of the Station, as embraced in its Annual Report, cannot be avoided, under the rulings of the United States Government officials, as to the requirements of the law.

WORKING FORCE.

After the Director entered upon duty, the first of April, assistants were appointed, from time to time, as the work developed. The permanent corps or working force now consists of the Director and five assistants, as named on page 48. From four to six laborers are employed with more or less regularity, and students of the College are engaged from time to time for such work as they are able to perform. No one who is not familiar with the routine of such a Station has any conception of the number of hours of labor and the careful attention to countless details in field, stable, workshop, and office, necessary to the proper execution of agricultural experiment work.

FENCING EXPERIMENTS.

It is above stated that much fencing has been done. Fences are expensive and in other ways objectionable, and should be avoided as much as possible, in general farm practice; but in a region of few fences, situated directly upon the highway, and with more or less stock roaming at large, the safety of the work necessitated complete fencing of the experiment fields. In doing this work an effort has been made for getting, in the course of time, some facts as to the preservation and durability of fence-posts. This experiment in post-setting is recorded later at page 76. It will be seen that in three parallel lines of fencing, not far apart and on similar soil, three different kinds of fence-posts have been set, and in each line, several of a kind tested in ten different ways, as to preparation or method of setting. The record is complete and the identity of the posts easily preserved, but it will, of course, be some years before results can be observed and reported. In connection with these and other fence lines, it is proposed to make a comparative test of different fencing materials, including several kinds of wire, and metal in other forms; this test will comprise original cost, durability, and the frequency and cost of repairs during a term of years.

FIELD EXPERIMENTS.

The late date at which it first became possible to work in the field, and the labor incident to general organization and preparation, made it impossible to undertake field experiments to any extent the past season. Yet certain pieces of work were accomplished which are not without interest.

Uniformity of Soil.—To secure a proper basis for future work, several acres were laid out in plots and cultivated in even-growing plants, without manures, thus testing the uniformity and natural productiveness of the soil. On the west side of the turnpike, and south of the Station building, what are to be known as the rotation plots were located—six half-acre plots. On these field-corn was grown and the record will be found later. The plots were harvested by quarter-acres, twelve in number, each nearly square. The product of field-cured stover ranged from 470 pounds to 774 pounds, or an average of 590½ pounds. This is at the rate per acre of 1,880 pounds to 3,096 pounds, average 2,362 pounds, of harvested stalks or stover. Eight of the plots were below the average in product and four above. The grain cured so poorly, owing to lateness of

crop and unfavorable season, that it was evidently fairer to compare the total product of ears, as husked, than to divide into sound corn and soft corn. The total weight of ears per plot ranged from 250 to 519 pounds, the average being 382½ pounds; this was at the rate of 1,000 to 2,076 pounds per acre, and an average of 1,530 pounds. Computed at 70 pounds ears to the bushel, the average was almost 22 bushels of shelled corn per acre. Five plots were above average and seven below it. Making allowance for the missing hills and computing to a full stand does not materially affect the result. On the east side of the turnpike, twenty-seven [27] plots were laid out, each one-eighth of an acre [3⅜ acres in all], and cultivated in the comparativly new forage plant from Japan, called the Soja Bean. Here the product ranged from 620 pounds to 1,386 pounds per plot, an average of 966½ pounds. This equals 4,960 pounds to 11,088 pounds per acre, average 7,732 pounds per acre. As explained in the record, the above figures include only 22 of the 27 plots; eleven were above the average and the same number below.

The results of these trials do not indicate that degree of uniformity in the soil desirable for field experiments, but the comparative record of production will materially aid in the interpretation, or qualification, of future results on the same plots.

Oats as Hay and for Grain.—An attempt was made to compare the value of an acre of oats while in bloom and cured as hay with a like crop harvested as grain and straw, all the facts being considered, including the chemical features of the question. The crops were successfully grown and harvested, but owing to inadequate storage room they suffered such injury from the depredations of sparrows and mice as to vitiate the record before it could be completed.

Varieties of the Cow-Pea.—Different varieties of the cow-pea were grown for comparison, and one, called the Unknown—the seed obtained from Georgia and Texas—was found to possess such special merits as to entitle it to a careful study another season.

Sorghum-Cane—Several varieties of sorghum were tried, but they started late, the season was unfavorable, and an early frost caught them before maturity. Some gave such promise as forage plants, however, that it is proposed to grow them more extensively next season, including both sugar-producing cane and non-saccharine varieties.

Ensilage.—A silo containing three compartments was built at the College cattle-sheds during the summer, its total capacity being about

ninety tons. The pits were filled, for experiment purposes, with material to make ensilage of several different kinds. Although the contents of the silo, as filled, can now be described, the record of results must be deferred till after the winter feeding.

The work above mentioned involved the cultivation of about twelve acres, and the details, as far as it seems expedient to give them, are included in the appended report of the Agriculturist of the Station.

Fodder-Corn and Fodder-Cane.—Upon four acres, divided into eight plots of one square half-acre each, different methods were tried of growing corn and sorghum for fodder. This experiment and its results form the subject of Bulletin No. 3, issued by the Station, under date of December, 1888. Reference is made to that for all details in this connection.

Potato Experiments.—For many years the potato has been a favorite subject for experiment, particularly with reference to different methods of cutting and planting the tubers. While it was hardly expected to obtain any new facts, it seemed desirable to cultivate an acre in potatoes for the purpose of adding to the store of experimental data on that subject. The results were found to agree with nearly all of those previously recorded in verifying the conclusion that *the more seed potato is planted the more and better the crop.* The details of this trial constitute Bulletin No. 2, issued by the Station in September. Although similar experiments are very numerous on small plots and in small quantities, records have not been found of careful verification of results on a farm scale. Verification now seems to be needed, rather than further experiments. It is therefore proposed to undertake such a test at this Station the coming season, by growing potatoes by the acre, in the comparative methods of most interest.

The appended report of the Horticulturist of the Station is mainly a contribution to the literature of the subject of cutting seed potatoes for planting.

Experimental Orchard.—The fruit interests of Maryland are so great, and still increasing, as to demand a fair share of the attention of this Station. As a preparation for variety tests and subsequent special fruit investigations, a large orchard has been planted during the past autumn. A detailed description of the Horticultural department, will be published in the spring bulletin, after completing the plantation of small fruits.

BULLETINS AND CORRESPONDENCE.—MEETINGS AND EXHIBITIONS.

The law establishing the Station for the purpose of "acquiring useful and practical information on subjects connected with agriculture" requires that this information shall be *diffused among the people*, and prescribes certain ways of so doing. This Station has accordingly striven to avail itself of every proper method of communication with Maryland farmers and gardeners, planters, and holders of rural real estate in general. The chief agencies have been the four mentioned in the heading just above.

Bulletins.—Three bulletins or "reports of progress," as prescribed by the Hatch Act, have been published and distributed as follows:

No. 1, June—History, organization, and work of the Station.

No. 2, September—Cutting seed potatoes for planting.

No. 3, December—Fodder-cane and fodder-corn, with Appendix.

Editions of six to ten thousand of these have been distributed to individuals desiring them, nearly all being sent free through the mails, as allowed by law. The bulletins have been issued in uniform style and consecutively paged, and this report will conform thereto, so that all the publications of the Station may be bound together. When enough have accumulated to form a volume, an index will be issued to complete the record to date, and a new series of paging can then begin.

The law provides that the publications of the Station shall be sent, free, to all newspapers in the State and "to such individuals actually engaged in farming as may request the same." This quoted restriction does not apply to the annual report. It is probable that, for the present, the Station will be able to send its publications to all who ask for them.

Correspondence.—As stated in the first bulletin issued, on page 15, the officers of the Station desire to be in direct personal communication with citizens interested in the work. The invitation to correspondence then given has met with response from all parts of the State. Letters received are increasing in number and variety and are given cheerful and generally prompt attention. This correspondence, if it continues to grow at the present rate, will form a large part of the office work of the Station.

Meetings.—For the purpose of considering the work of the Station and subjects related to it, the Director and the assistants will, as far as home duties permit, be pleased to attend meetings of farmers' clubs, granges, and agricultural societies and associations, in various

parts of the State. A number of such meetings have already been attended in eight different counties, and it is believed that this direct intercourse between the practical farmers of the State and the Station workers, will materially assist in turning the labors of the latter in the right direction and increasing the value of their results.

Individuals, committees, and parties of any size, interested in the work, are invited to visit the Station at any time and will always be welcomed and given every possible attention.

Exhibitions.—During the autumn, displays were made by the Station, in the form of object lessons, illustrative of its work, at the annual agricultural exhibitions of the counties of Harford and Frederick and the State Fair at Hagerstown. Members of the Station staff, assisted by students of the senior class of the College, were in attendance, to explain the exhibits, distribute bulletins, and give information regarding the Station and its purpose. The exhibits thus made received much attention and commendation, and this method of extending a knowledge of the work was so successful, as a whole, as to justify repetition another year upon an extended scale.

CONCLUSION.

Attention is invited to the reports already mentioned and which immediately follow, as a part of the record for the year 1888.

In conclusion, I desire to express my full appreciation of the cordial support received from the Board of Trustees and the interest and encouragement shown by many hundreds of the farmers and landowners of the State, during the preparatory months of this new work. My thanks are due to all the assistants for their faithful, intelligent, and efficient services.

The Station may now be considered as well organized and equipped and ready for a full season's work during the new year upon which we have entered. With a lively interest on the part of the people of the State, united with reasonable patience and kindly criticism, it will be the fault of those entrusted with the management of its affairs if this institution does not now succeed in satisfying, to a considerable degree, those for whose benefit it was founded.

HENRY E. ALVORD, *Director.*

THE MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE UNITED STATES APPROPRIATION.

1888.				DR.
	To receipts from Treasurer of the United States, as per appropriation for year ending June 30, 1888, under act of Congress approved March 2, 1887			$15,000 00
		Led. p.	CR.	
June 30.	By salaries	202	$1,369 22	
"	labor	212	604 29	
"	supplies	228	664 14	
"	freight and expressage	240	175 71	
"	postage and stationery	244	116 60	
"	printing	248	39 20	
"	library	252	1,585 83	
"	tools, implements, and machinery	256	503 33	
"	scientific instruments	262	564 35	
"	chemical apparatus and supplies	266	1,311 60	
"	furniture	272	1,004 45	
"	general fittings	274	2,259 48	
"	fencing and drainage	282	1,136 07	
"	live stock	286	490 00	
"	traveling	288	102 83	
"	incidental expenses	292	49 40	
"	buildings	276	2,998 78	
				14,975 28
	Balance unexpended			$24 72

We, the undersigned, duly appointed auditors for the corporation, do hereby certify that we have examined the books and accounts of the Experiment Station of the Maryland Agricultural College for the fiscal year ending June 30, 1888; that we have found the same well kept and correctly classified as above, and that the receipts for the time named are shown to have been $15,000.00, and the corresponding disbursements $14,975.28, for all of which proper vouchers are on file, and have been by us examined and found correct—thus leaving an unexpended balance of $24.72 to be accounted for in the fiscal year commencing July 1, 1888.

(Signed) ALLEN DODGE,
(Signed) CHAS. A. WELLS,
Auditing Committee, Board of Trustees.

I hereby certify that the foregoing statement is a true copy from the books of account of the institution named.

(Signed) W. HORACE SOPER, *Treasurer.*

REPORT OF THE HORTICULTURIST.

POTATO EXPERIMENTS.

During the past half century the potato has been the subject of almost numberless experiments in various directions, both recorded and unrecorded.

An impetus was given to the work by the great outbreak of the rot in 1845, and for several years after this, notably in 1846 and 1847, many articles were written and conjectures formed, as well as considerable experimental work performed, upon the one subject of the "potato disease" or the "potato rot."

Experiments with fertilizers and trials of different amounts of seed have been numerous, and results, although varying widely in individual instances, have on the whole tended to the establishment of a few well-founded principles. For instance, the fertilizer tests have shown us that, although the potato contains a large proportion of potash, and might be called a special potash feeder, the fertilizers giving good results have almost invariably contained a fair percentage of nitrogen, and for the best results a fertilizer, containing all three of the prominent constituents of plant food, is necessary rather than one containing the single ingredient, potash.

Before considering further the results of experiments, something may be said of the structure of the potato tuber. Cutting it lengthwise through the center, in such a manner as to divide several of the eyes, and examining a thin section or slice of either half, several well-defined regions are found, varying in appearance and size. In the center, with a branch running to each eye, is a tract which is more transparent than the surrounding flesh. This corresponds to the pith of ordinary stems, and, like it, has less capacity for conducting water. Its lighter color is due to the smaller proportion of solid matter, starch especially, found in the cells. This "pith," like that in other stems, has less vitality than the other portion of the tuber, and probably, less strength in the cell walls; therefore, when very rapid growth takes place, these cells, being unable to resist the tension, burst, and a hollow place in the tuber is the result. Passing outward through the main body of the tuber, and, lying about a quarter of an inch under the skin, a thin line can be easily seen which follows quite regularly the general outline of the potato, except at the eyes, where it curves outward to the surface. This is the cambium ring, the portion from which, in woody stems, all

growth in thickness proceeds. The skin of the potato is simply a thin layer of dead, empty cork cells, which protects the flesh within from the action of various substances in the soil, renders it less liable to wounds, and prevents the undue action of air and moisture on its tissue. But, were this integument perfectly air and water tight, growth could not take place at its proper season; therefore, there are scattered about upon the skin minute, wart-like bodies known as lenticels, which are composed of loosely arranged cork tissue, that permits air and water to pass into the substance of the potato when vegetation commences. It is now a well-established fact that the formation of "scab" on the potato begins at the lenticels.*

The similarity between the potato [an underground stem] and ordinary aërial stems is seen in several characteristics, foremost among which is the presence of buds upon the surface. These buds or eyes, as we usually call them, are arranged spirally, and each may be considered as growing in the axil of a leaf. This leaf, or even a rudiment of it, is rarely seen, but occasionally a very slight, thin projection is found, like a miniature hood, over the eye of the tuber. This little, scale-like body may be likened to the leaf of an aërial stem and the eye beneath, to the bud formed in its axil.

The tip [seed end] of the potato is analogous to the growing point of a leaf shoot, around which are arranged the rudimentary leaves and buds, and from which growth in length proceeds by the gradual pushing outward of the growing tip, leaving the leaves and buds to assume their proper relative positions on the stem.

In further support of the fact that the potato is a stem and not a root we quote the following interesting statements:†

"If, at the period when the formation of tubers has not yet commenced, the portion of the leaf shoot which is above ground is cut off, the terminal buds of the still young, filiform [thread-like] runners become converted into ordinary leafy shoots and grow out above the surface of the soil. * * * Thus, by removing the young main shoot it is possible to cause its lateral shoots, which would otherwise form tubers, to assume an entirely different form of growth. * * * It is also possible to cause the production of tubers at will on the sub-aërial [above ground] leaf shoot, if the subterranean lateral shoots destined for the formation of tubers are carefully cut away from a vigorously growing plant and the possibility of the formation of tubers below ground prevented. The materials normally adapted for the formation of potato tubers now pass into the axillary buds of the leaves and cause their axial portions to remain short and to swell up and thicken, while their leaves develop but feebly."

---

* See Bulletin No. 8, Botanical Div., U. S. Dep't of Agriculture.
† See Sachs' Physiology of Plants.

Having satisfied ourselves that, in the reproduction of the potato by means of the tuber we are dealing with a stem and not with a seed, we can readily see that an entirely different line of reasoning must be adopted in accounting for results from that used when plants are propagated from seed.

Experiments designed to ascertain the proper amount of tuber to plant in order to obtain the best crops, have been many and very varied in character, so much so, in fact, that we cannot, as we should like, tabulate the results.

Aside from the great differences in the methods of work, which are such that comparative records of but a very few cases can be made, many are lacking in details that are absolutely necessary to an intelligent consideration of their results, while others are so arranged that no comparisons can be made. A series of isolated trials, without some well-known ordinary method tried simultaneously, for comparison, is of little value, as, for instance, the testing of several unusual and extraordinary methods of preparing seed without a comparative test of some common method at the same time. The record of, and deductions from, an experiment with different amounts of seed potato, carried on here in 1888, have been published in Bulletin No. 2, and in this digest of what has been learned upon the subject we shall simply make reference to it as to other sources of information. The results of our work were so pronounced that, recognizing the danger in basing opinions upon the records of a single experiment, we have attempted to make a complete list and study of the other work upon this subject, that has been performed from time to time in this country.

A few very definite conclusions are forced upon us by the critical examination of the records of the numerous experiments designed to ascertain the proper amount of seed potato to plant.

1st. A large majority of the experimenters have arrived at the conclusion that *the larger the quantity of seed planted, the greater the corresponding crop.* In support of this statement we would refer the reader to Bulletin No. 2, of this Station; to the Reports of the Ohio Agricultural Experiment Station; to the Reports of the New York State Experiment Station, or to any one of a dozen of the Reports named in our list. A few quotations from the conclusions of several of the experimenters are here given.

The Journal of the Royal Agricultural Society of England, 1869, records an unusually well-conducted and well-reported trial of different methods of planting potatoes. Among the "conclusions" is the following:

"Every increase in the size of the set, from one ounce up to eight ounces in weight, produces an increase in the crop much greater than the additional weight of sets planted. It may be broadly stated that the weight of the crop is proportionate to the weight per acre of the sets planted."

Mr. Edmund Hersey, a careful experimenter, reports, in "Agriculture of Massachusetts," 1886, the results of several years' trials. On page 115 are the following words: "The product from the whole potatoes has been more than three times that from single eyes." A duplicate trial with a different variety gave the same result.

From an experiment under the direction of the Farmers' Club, at Sandy Spring, Md., and recorded, incidentally, in the Report of the United States Department of Agriculture for 1867, this deduction is made:

"We find that large potatoes, planted whole, yielded an increase nearly three times as great as small potatoes cut to one eye, while there is a tolerably uniform and regular decrease in the product, in proportion as the size of the seed is diminished, and as it is cut into smaller pieces."

While it is proven beyond question that in the majority of cases the larger amount of seed produces the larger crops, we would not be understood as advocating the planting of very large whole potatoes, notwithstanding the fact that in many cases the returns from their use have been enough greater to make it profitable. Such was the case in our experiment this year. In many other trials the yields have not been enough larger to pay for the difference in cost between large selected tubers and those of medium size. It may therefore be said that it is not safe to expect the largest *profits* from planting the largest potatoes.

2d. An extreme to be avoided is the planting of too small an amount of seed.* It is never profitable, in field culture, to plant a single eye bearing less than its proportion of the substance of the whole tuber. With garden culture and an exceedingly limited quantity of seed, as in the case of a rare or high-priced novelty, methods of propagation that have no place in field culture may be resorted to with profit, for it is a well-known fact that the smaller the quantity of seed tuber used the greater is the multiplication of the seed. For the farmer, the cases are very rare when the planting of a single eye in a hill is desirable, even though it bears its full

* It will be understood that the word "seed" is here used in the popular sense, as referring to the tubers planted, and not to the actual seed from the potato ball.

part of the tuber from which it was cut. It is hardly stating the case too strongly to say that in no recorded experiment has it been found that a single eye per hill gave as large returns as a larger number of eyes; and this fact stands in spite of difference in distances of planting. In one or two instances the margin between the yields from one and two eyes per hill is very slight indeed, but these are the exceptions to the rule. Therefore, judging from all the reliable figures at hand, we conclude that one eye is too small a quantity of seed for a hill of potatoes, and that, although the individual tubers of the succeeding crop may, possibly, be a trifle larger, the total yield of good-sized, merchantable potatoes will undoubtedly be smaller than if two or more eyes were used.

As in many other instances, so we find here, that extremes are unprofitable or injudicious, and that, for the best returns, we must resort to a mean. Between these extremes this mean is very variable, and a large latitude is left to suit differences in soil, cultivation, climate, cost of seed, varieties, and men. We are strongly inclined to believe that there is less danger of erring in planting a whole medium-sized tuber, of about three ounces in weight, per hill, than in planting a smaller amount; but here the judgment of the individual must be used.

3d. There is no evidence to prove that there is any advantage in planting pieces of large potatoes instead of pieces of small ones, or even whole small tubers, of equal weight with the former. Several experiments have failed to detect any difference in yield from equal weights of small and large potatoes, the pieces bearing the same number of eyes.

Another quotation from Mr. Hersey will sufficiently illustrate this point:

"This experiment shows the results of a test of the value of small whole potatoes, as compared with large cut ones, the small potatoes being about one inch in diameter, and the pieces were cut from potatoes weighing about one-half a pound each and cut of a size to weigh exactly the same as the whole small potatoes, each whole potato and each piece having the eyes reduced to two before planting. For the seven years, in which this experiment has been annually tried, No. 1 produced 205$\frac{1}{8}$ pounds of large and 62 pounds of small potatoes. The same number of hills of No. 2, the cut seed, produced in the same time 192$\frac{5}{8}$ pounds of large and 71$\frac{3}{4}$ pounds of small potatoes, the small seed producing 13 pounds more of large potatoes and 8$\frac{3}{4}$ pounds less of small ones than No. 2, the seed cut from large potatoes."

4th. Is one portion of the tuber any better for planting than another?

There is very little difference in the productiveness of the different parts, the advantage, if there is any, being in favor of the tip or "seed end," as from it we get the earliest and most vigorous plants. In most experiments, too, it has given a slightly increased yield. Certainly, it is not inferior to any other portion, as is sometimes supposed.

5th. It is sometimes recommended that a whole tuber be planted with all eyes except one or two cut out, upon the theory that the larger amount of food available for the young plant would produce a larger crop.

There is at present very little experience that would tend to show any advantage for this system. While a somewhat greater crop might be secured it would, probably, as in the case of the very large whole potatoes, be at too great an expense to render the practice profitable. Moreover, the increase from large amounts of seed is not obtained because of the supposably greater quantity of food thus furnished the young plant, but rather because of the larger number of eyes planted; for it is very obvious that when a whole potato is cut into pieces bearing two or three eyes each, no more food is left per eye than if the same tuber were cut into pieces having only a single eye each. It has already been learned that the young plant is dependent but a very short time upon the tuber from which it sprung, although it may continue to absorb nutriment from it during a considerable period of its growth. At the New York Experiment Station no marked difference in yield was obtained when the seed tuber was removed three weeks after planting, as compared with plants upon which it was allowed to remain. [Report of the New York Experiment Station, 1885.]

6th. What is the effect of cutting potatoes several days previous to planting?

Probably there is no loss of crop if the pieces are planted within a week or ten days, and in case the soil is wet after planting, the dried pieces may be better able to withstand a tendency to rot before sprouting.

7th. The selection of the tuber for planting is worthy of more attention than is ordinarily given it, for there is some evidence that potatoes taken from the most productive hills produce more than those from less productive ones.

There seems to us to be the strongest theoretical probability that continued selection in this direction would result in marked increase

of yield, and we wonder that farmers have not more generally adopted the practice. The differences in the productive capacity of individual plants has been made use of to "improve the breed" in many other of our farm and garden crops, and the rule should hold good with the potato. Let any farmer try for himself the effect of planting tubers taken from the most productive hills of his field, being sure, first, that the hills he selects from were grown from the same number of eyes each, and he may be pretty sure of finding himself well repaid for the slight additional labor required.

The following list of references comprises most of the records on this subject which are valuable to the investigator:

REFERENCES TO SEED-POTATO EXPERIMENTS.

Reports U. S. Dep't of Agriculture for 1847, 1867, 1869, 1874, and 1875.
Ohio Agr'l Exp't Station Report for 1882, 1883, 1884, 1885, and 1886.
N. Y. " " " 1883, 1884, 1885, 1886, and 1887.
Mass. " " " 1884, 1886, and 1887.
Cornell Univ. " " 1883, 1885, 1879, and 1880.
Wisconsin " " 1883.
Vermont " " 1888.
Report Penn. Agr'l College, 1886 and 1887.
Report Missouri State Board of Agr., 1871, 1872, and 1873.
Wisconsin Ag'l Exp't Station, Bulletin No. 13, Feb., 1888.
Minnesota " " " No 1, Jan., 1888.
Kentucky " " " No. 9, Mar. 1887, and No. 16, Dec., 1888
Colorado " " " No. 4, Feb., 1888.
Maryland " " " No. 2, Sept., 1888.
Michigan Agr'l College, Bulletins Nos. 13 (1885) and 34 (M'ch, 1888).
Missouri Ag'l College, Bulletin No. 12, Oct'r, 1884.
New Hampshire Agriculture, 1880.
Agriculture of Massachusetts, 1886.
Journal of the Royal Agricultural Society, Eng., 1867.
Journal d'Agriculture Pratique, 1870.
Country Gentleman, Jan. 18, 1887.
New England Homestead, Nov. 23, 1888.

W. H. BISHOP,
Horticulturist.

REPORT OF THE CHEMIST.

To the Director.

Sir: I have the honor to make the following report on the character and extent of the work done by me since appointed, in June last, as Chemist of this Station.

Under your instructions, I visited some of the Experiment Stations of the Eastern States and inspected their laboratories, both as to fittings and the latest form of apparatus. The object was to gain such information as would enable us the better to equip our laboratory with the most modern improvements for analytical work and work of research in all the branches of agricultural chemistry.

Our laboratory is situated on the first floor of the Station building, extending entirely across the south side. It is a room 33 feet by 16 feet, having six windows and an abundance of good light in every part of the room. There are two chimneys, not used above this floor, which afford good ventilation and ample draft for hoods. The wall spaces are all occupied with shelves and tables, containing drawers and cupboards. The working tables are supplied with numerous gas jets and suction filters, in convenient positions. A center-table, 3 feet by 5 feet, with a large sink and supplied with running water, is convenient to all parts of the room. Under this table is a drain-board, on which dishes which have just been washed may be drained and the drippings pass into a waste pipe.

The gas is supplied by a combination gas machine, of 80-light capacity, put in by the Detroit Company, and mainly for the use of the laboratory.

Live steam from the boiler is furnished for heating the laboratory and in the drying closet for changing fresh samples to the air-dry condition; also in steam baths for evaporation and for distilling water.

In the southeast corner is an alcove, separated from the main room by a glass partition, and in this the analytical balances are kept. The balances are thus well protected, and at the same time a person using them is able to keep all parts of the laboratory and its work in plain sight.

Most of the apparatus was procured through Messrs. Eimer and Amend, of New York city, the greater part being imported duty free.

Owing to some delays in getting important pieces of apparatus, with the time necessarily occupied by the mechanical work of

putting all the equipment and fittings in place, it was the first of November before any purely chemical work could be done.

Besides the work incident to superintending the fitting up and arrangement of a new laboratory, the compounding and standardization of solutions, the testing of apparatus, etc., I have completed the analyses of thirty [30] samples of fodder and fertilizers, besides preparing sample sets representing the composition of some food and fertilizing materials.

Tables are annexed giving by classes the results of the analyses made and brief descriptions of the samples.

Respectfully submitted.

HARRY J. PATTERSON,
Chemist.

DECEMBER 31ST, 1888.

A.

COMPOSITION OF FERTILIZING MATERIALS.

No. of sample.	Substance.	Nitrogen.	Potash.	Total phosphoric acid.	Available phosphoric acid.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.
1	Dissolved animal bone and potash.	2.10	9.62	10.92	8.92	7.64	1.28	2.00
2	Ammoniated bone superphosphate.	1.89	1.34	11.24	7.08	3.48	3.60	4.16
3	Dissolved bone-ash and ammonia.	2.80	0.92	18.28	14.70	11.28	3.42	3.58
4	Ammoniated superphosphate.	2.13	1.53	11.36	7.56	4.60	2.96	3.80
5	Dissolved animal bone	2.50	------	13.92	11.36	9.84	1.52	2.56
6	Cotton-seed meal	7.66	1.53	2.96	------	------	------	------
7	Dry ground fish	7.56	------	6.64	------	------	------	------
8	Sulphate of potash (high grade).	------	52.38	------	------	------	------	------

B.

DESCRIPTION OF FODDER SAMPLES.

No. of sample.	Description of sample.	Date of cutting.	Yield per acre, green (lbs).
1	Fodder-corn, Drills, 3 ft.; height, 9 ft.	Sept. 22, 1888	19,540
2	" " " 18 in.; " 7 ft.	Sept. 25, 1888	15,584
3	" " " 9 in.; " 5¾ ft.	Sept. 26, 1888	12,700
4	" " Broadcast; height, 5 ft.	Sept. 27, 1888	11,464
5	" " Slightly frosted	Oct. 4, 1888	
6	" " After heavy freezing	Oct. 29, 1888	
7	" " "Baker's Sweet," frosted	Oct. 4, 1888	
8	Fodder-cane, Chinese sorghum; hills, 3 x 3 ft.	Oct. 25, 1888	39,325
9	" " Early Orange sorghum; hills, 3 ft.	Oct. 25, 1888	32,670
10	Oats used for hay, grain in milk state	July 14, 1888	
11	" " " " " " dough "	July 21, 1888	
12	Johnson grass, Sorghum Halapense, 6 to 7 ft. high.	Sept. 6, 1888	32,600
13	Soja bean; rows, 3 ft.; height, 2½ ft.	Sept. 3, 1888	8,674
14	" " taken at time of harvesting; height, 3 ft.	Sept. 22, 1888	9,044
15	" " taken at time of harvest, grown on poorer soil.	Sept. 26, 1888	6,824
16	" " after being frosted	Oct. 25, 1888	1,056
17	Unknown pea	Sept. 3, 1888	11,949
18	" pea, at time of plowing under	Oct. 3, 1888	13,310
19	Cow-pea, grown on same soil as Unknown pea	Sept. 3, 1888	12,705

C.

COMPOSITION OF FODDER SAMPLES.

No. of sample.	Water-free substance.							
	Total dry substance.	Ash.	Protein.	Crude fiber.	N.-free extract.	Crude fat.	Total nitrogen.	Albuminoid nitrogen.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1	21.25	5.68	5.03	35.88	47.80	5.61	0.80	0.72
2	19.82	4.74	5.11	31.46	53.18	5.51	0.81	0.69
3	20.33	5.18	5.59	35.30	48.55	5.38	0.89	0.53
4	22.07	4.90	8.31	35.59	47.42	3.78	1.33	0.95
5	14.00	5.54	7.42	27.02	54.75	5.27	1.18	0.98
6	22.47	5.26	5.31	31.76	54.55	3.12	0.85	0.59
7	23.10	5 48	6.89	26.41	56.56	4.66	1.09	0.83
8	21.62	6.18	6.97	31.52	50.53	4.80	1.11	0.89
9	16.85	4.27	7.94	32.52	50.84	4.43	1.26	0.98
10	44.26	7.35	10.97	33.11	41.86	6.71	1.76	1.13
11	68.66	6.09	8.86	24.44	57.89	2.72	1.41	1.06
12	38.00	4.17	4.80	37.51	51.08	2.44	0.77	0.58
13	18.84	12.42	15.31	37.67	30.76	3.84	2.44	1.59
14	19.91	11.55	11.91	30.85	41.87	3.82	1.89	1.49
15	22.63	11.14	12.33	24.69	47.75	4.09	1.96	1.61
16	37.71	6.92	12.25	33.20	44.47	3.16	1.95	1.19
17	6.91	24.69	22.04	24.81	25.28	3.18	3.52	2.59
18	12.87	13.57	15.25	26.47	41.31	3.40	2.44	1.92
19	10.82	16.46	18.41	27.35	33.65	4.13	2.94	1.91

REPORT OF THE AGRICULTURIST.

THE ROTATION PLOTS.

To determine the effect upon well-worn lands of a systematic rotation of crops, both with and without manures, six plots of land containing a half acre each have been laid out directly south of the Station building, and set apart for the rotation experiments. These plots are sixteen rods long and five rods wide; the length is east and west and they lie side by side, with intervals of six feet between them and driveways twelve feet wide across the ends. They are numbered I to VI, from north to south. The general character of the entire field is a clay loam, showing more or less gravel. The subsoil is a peculiar mixture of clay and gravel, rather shallow, and beneath this is a yellow hardpan. The six plots are fairly even in character, although the extremes, I and VI, are somewhat lower than the others, and No. IV is a little higher and the soil rather lighter than the rest. All need under-draining, and this will soon be done. The exact previous history of this land cannot be given. Prior to 1880 it was cropped for a number of years, and since that date it has not been cultivated. Light crops of grass have been taken from it annually, and it bore a very thin, scattered covering, more weeds and briars than grass, in the spring of 1888. The land had every appearance of being well exhausted.

This field was plowed, thoroughly harrowed, and the plots laid off during the first ten days of May, 1888. The first season was used for growing a crop of corn, without manure, to further reduce the soil and test the natural quality and uniformity of the plots. They were planted with yellow dent corn, check-rowed, dropped by hand, and covered with cultivator, on the 6th of June. The corn was generally well up on the 14th and was cultivated on the 18th; replanted the 23d; cultivated, in alternate directions, June 25th, July 2d, and July 18th. It was thinned and thoroughly hand-hoed July 17 and 18. Rains immediately following, the plots were again cultivated July 24, and no further work done upon them until August 16, 17, and 18, when they were hand-hoed, mainly to kill briars and autumn weeds. The corn was cut off at the ground and stooked in the field October 13, and left to cure until December 5, when it was shucked and weighed.

The season was not favorable to a corn crop. Nights were too cold, there was insufficient sunshine, and during the curing period continually wet or very damp weather.

Following is a tabular record of the crop as harvested in half plots or quarter acres:

TEST CROP OF CORN, WITHOUT MANURES, ON THE ROTATION PLOTS, 1888.

1888.	Actual crops.		Number of missing hills.	Computed for full stand.	
Plots one-half acre each.	Stover or stalks.	Corn ears, total.		Stover or stalks.	Corn ears, total.
	Lbs.	*Lbs.*		*Lbs.*	*Lbs.*
Plot I., Sec. A.	700	447	31	723.8	462.
" " " B.	660	448	43	699.1	472.7
Plot II., Sec. A.	484	250	26	500.5	257.1
" " " B.	564	417	28	585.2	432.7
Plot III., Sec A.	684	363	19	700.7	371.9
" " " B.	580	290	26	699.8	299.5
Plot IV., Sec. A.	584	368	35	611.3	385.
" " " B.	538	510	28	558.2	428.9
Plot V., Sec. A.	470	282	25	485.1	291.
" " " B.	494	342	23	508.9	351.8
Plot VI., Sec. A.	554	519	16	565.1	529.7
" " " B.	774	353	21	795.4	360.3

THE SOJA BEAN [*Soja hispida*].

The object of this crop was to test the qualities of this Japanese forage plant, and also to ascertain the comparative productiveness of the plots on which it was grown. By thus comparing the different plots planted with the same crop and cultivated under identical conditions, a record is obtained upon which to base subsequent experiments on the same plots. No fertilizer was used, in order that the comparison should be made only on the merits of the plots.

The field of three and three-eighths acres was divided into twenty-seven plots, each ninety-nine feet long by fifty-five feet wide, containing exactly one-eighth of an acre. The season was very late, and planting was deferred till the 9th of June. The seed was sown in rows two and a half feet apart, at the rate of sixteen quarts per acre. Nearly all of the seed germinated, and the plants stood be-

tween one and two inches apart in the row. Growth was very slow until about the 10th of July; then a blight seemed to seize the plants and all growth stopped. The leaves curled up, losing their bright green color. The plants at this time were about eight inches high. The cause of this trouble was not ascertained. Aphides were found on the leaves and the ends of the roots were dead. This condition continued about a month. The soil was kept well cultivated and was in good condition during the entire season. About the 10th of August new leaves began to appear, and the growth was very vigorous from that time till harvest. The average height attained was two feet, but in some places of stronger growth the stalks were three feet high. The work of harvesting was begun September 21st. The pods had begun to form but the seed was not developed. The stems were hard and woody near the ground. The crop was run through a fodder-cutter and ensiloed with corn and sorghum, alternating the loads as they were drawn, thus mixing the three forage plants. This proves to be a food eaten very readily by cattle and showing a marked improvement in the flesh of the animals and in quantity of milk produced. The woody stems of the beans are kept moist in the silo and the stock eat them up clean.

YIELD OF FORAGE, EACH PLOT SEPARATE.

Plot No.----	1.	2.	3.	4.	5.	6.	7.	8.
Yield, lbs. --	1,290	1,386	1,272	1,014	1,064	1,012	1,106	928
Plot No.----	9.	10.	11.	12.	13.	14.	15.	16.
Yield, lbs. --	1,110	1,036	1,076	1,036	840	970	886	820
Plot No.----	17.	18.	19.	20.	21.	22.		
Yield, lbs. --	871	672	856	654	744	620		
Plot No. ---	23.	24.	25.	26.	27.			
Yield, lbs. --	202	100	182	82.	224			

The largest yield was 1,386 pounds per plot, or at the rate of over five and one-half tons per acre [11,088 lbs]. This would undoubtedly have been very much increased by a reasonable quantity of manure or fertilizer.

Plots Nos. 23, 24, 25, 26, and 27 were allowed to remain in the field after the others were harvested, for the purpose of getting mature seed from them, but the early frost prevented a natural development. When harvested, October 30th, the beans were less than one-third the size of the seed planted. Although so small and ap-

parently immature, every seed germinated when tried by the hundred in the seed-tester. The greatly decreased weight of product from these plots, as compared with the rest, is due to loss of moisture and blowing off of leaves after being frost-bitten.

The chemical composition of this plant, in different stages of growth, is given in the table of analyses on page 69, samples 14 to 16, inclusive. For convenience these analyses are partially repeated in the table following, average American analyses of red clover and timothy being added for comparison:

Sample.—Forage plants.	Total dry substance.	Water-free substance.				
		Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Crude fat.
Soja bean. Sept. 22	19.91	11.55	11.91	30.85	41.87	3.82
Soja bean. Sept. 26	22.63	11.14	12.23	24.69	47.75	4.09
Red clover	19.80	7.46	12.81	29.30	48.37	2.06
Timothy	31.00	4.47	7.11	33.45	53.03	1.94

From the above, and other records, it may be stated that, when the Soja Bean and common Red Clover are compared ton for ton of green product, at time of harvesting, the former gives more total dry substance, or food, than the latter, and this in the form of more valuable nutrients. It has also been abundantly proven that land which will not produce enough clover to pay for cutting, will yield an average crop of the Soja Bean.

THE "UNKNOWN" PEA.

This is a very promising one of the numerous varieties of the well-known cow-pea (*Dolichos*, ——*?*).

Two fields were planted with this pea. Number one, containing an acre, was plowed in as fertilizer; number two, about one-fourth acre, for the purpose of raising seed. The lot designed to be turned under received a dressing of one hundred pounds of dissolved animal bone per acre (see No. 5 of Table of Fertilizer Analyses) and was planted July 3rd in rows three feet apart, hills two feet apart in the rows, three seeds to the hill. Germination was very good and the growth was thrifty, the vines completely covering the ground,

when plowed under, October 5th. At this time very few pods had formed and no seed was matured. The yield was greater than with the common black pea, planted beside it, under similar conditions and where fully ten times as much seed of the latter was used.

Field number two, being a heavier land, did not develop pods before being cut down by early frosts, but the vines showed the same rank growth as number one.

The chemical composition of samples of this plant, and of the common cow-pea, grown on the same soil, is given in the preceding table of fodder analyses, numbers 17, 18, and 19. No remarks on this comparison seem expedient until further data are obtained.

ENSILAGE STORED.

The silos constructed this past summer are cheap and simple; three pits are side by side under one roof, and each is twelve feet square and fifteen feet deep.

The work of filling the silos was commenced September 22d. When stored, the corn kernels were in a glazed condition, the sorghum seed was in the dough and the pods had formed on the soja bean, but the seeds were not fully developed.

About half the depth of silo No. 1 was filled with corn and beans, the loads being alternated; the layers of each were three or four inches thick after settling. Sorghum was added in filling the remainder of the silo, and the whole was allowed to settle. Except in the case below noted, all the forage was cut one-half inch long, with the "Lion" feed-cutter. Being well trodden while filling, the contents of No. 1 did not settle much; on September 28th it was refilled, and after covering with roofing paper and boards, it was weighted with brick, thirty pounds to the square foot.

Silo No. 2 was filled between September 28th and October 4th with sorghum, alternated with corn. This mixture filled the silo half full. This was allowed to remain unweighted. October 25th it had settled about two feet, the top having decayed about three inches in depth. The decayed portion was taken off, the silo filled up with frosted sorghum and the decayed part replaced. This pit was not again disturbed until opened for feeding.

The heavy frost of October 3d cut all fodder left in the field, and no forage was placed in silo No. 3 that had not been frost-bitten. On October 4th this silo was filled to within four feet of the top with corn, when an accident to the power used made it necessary to stop cutting, and the remaining space was filled with whole corn-fodder. No weight was put on this at this time. October 30th the ensilage

had settled about three feet. The decayed portion on top was removed and the forage from five-eights of an acre of soja beans was put in, occupying about one and one-half feet in depth, covering one-half the surface of silo. The other half was then filled in with cut corn-fodder and the whole weighted with about thirty pounds to the square foot.

ALBERT I. HAYWARD,
Agriculturist.

RECORD OF METEOROLOGICAL OBSERVATIONS AT WASHINGTON, D. C., FOR THE AGRICULTURAL SEASON OF 1888.

1888.	Temperature of atmosphere, in degrees Fahr.					Rainfall.
Months.	Mean.	Maximum.	Day of max'm.	Minimum.	Day of min'm.	In inches and hundreths.
May	62.7	89	29th	39	3d	4.77
June	73.0	94	23d	52	3d	3.53
July	73.6	94	7th	56	13th	4.47
August	75.8	97	8th	52	29th	3.35
September	64.8	84	12th	39	30th	6.82
October	52.6	75	19th	35	22d	3.27

Barometric Pressure, in Inches and Hundredths.

Months.	Mean.	Maximum.	Day of max'm.	Minimum.	Day of min'm.
May	29.88	30.17	3d	29.57	12th
June	29.85	30.16	5th	29.63	23d
July	29.93	30.15	3d	29.52	12th
August	29.91	30.17	11th	29.34	21st
September	29.97	30.39	7th	29.61	26th
October	29.91	30.30	31st	29.43	1st

SPECIAL NOTES.—Light frost, September 30th; light frosts, October 3d, 18th, 21st, and 30th; hard frosts, October 4th, 10th, 22d, and 31st.

N. B.—The Md. Agr'l Experiment Station being unprepared for observations during the period indicated, this data has been courteously furnished by the Signal Office, War Department, Washington, D. C.—H E. A.

RECORD OF SETTING FENCE POSTS FOR THE DETERMINATION OF DURABILITY, WHEN PREPARED IN DIFFERENT WAYS.

On three different lines of fence, two of them parallel and but a few rods apart, the posts, of three kinds, were treated in ten different methods.

On line "F," on the east side of the turnpike, beginning with the first post south of the large orchard gate, the posts were of round seasoned cedar. Line "E," on the west side of the turnpike, begins with the southern gate post, and the posts were green sawed chestnut. Each line contains one hundred posts, treated in duplicate sets of ten, as follows, from north to south:

1. The first ten were set in the usual manner, holes dug with a post-hole digger or shovel, and no special preparation given, either to the holes or the posts.

2. The second ten were coated with coal-tar for about three feet three inches from the base, including the bottoms.

3. The third ten had a ring or band of coal-tar, one foot wide, beginning at a point about two feet three inches from the base and extending upward.

4. The fourth ten treated like the second, but using creosote oil instead of coal-tar.

5. The fifth ten treated like the third, using creosote oil in place of coal-tar.

6. The sixth ten were treated like the second, but using crude petroleum instead of tar.

7. The seventh ten were treated like the third, using crude petroleum in place of tar.

8. The eighth ten had about three and one-half feet of the base coated with crude petroleum and then charred, by burning off the oil.

9. The ninth ten were set in holes fifteen to eighteen inches in diameter; the posts had no special preparation, but the holes were filled with stones and brick-bats to within three inches of the surface, when soil was put on to finish filling the hole.

10. The tenth had, also, no preparation, but were set in holes of the same size as those for the ninth lot, and filled with the original soil, well tramped down.

The above was repeated on a line of fence south of the Station buildings, extending westward from the turnpike. On this line the posts were seasoned, sawed oak, and the preparation was by lots of three instead of ten, as on the other lines. This line begins with the first post west of the post on which are hung the two gates nearest the turnpike.

All these posts were set during the month of May, 1888, in holes three feet deep.